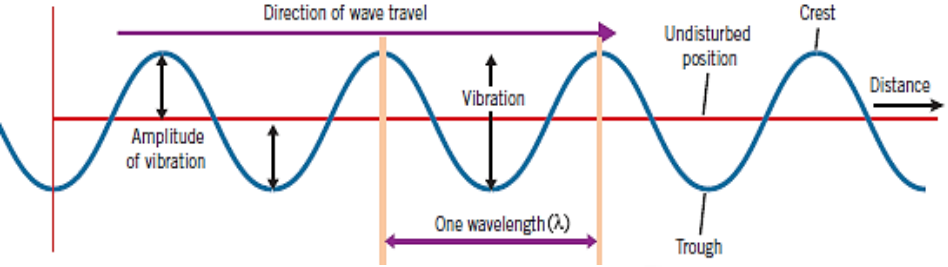
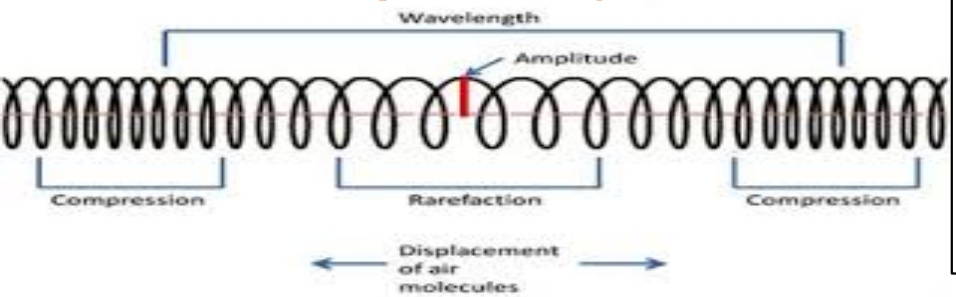
Knowledge Organiser – Forces and Waves

Knowledge and Content

- Describe how a fluid exerts a pressure on a surface and describe how pressure varies with depth in a fluid
- Show that the atmosphere exerts a high pressure and explain how atmospheric pressure varies with height
- Explain why you need two forces to stretch a spring
- Describe the difference between elastic and inelastic deformation
- Calculate extension, compression and elastic potential energy
- Describe the amplitude, wavelength, frequency and period of a wave
- Compare the motion of transverse and longitudinal waves and give examples of both
- Explain how the speed of sound in air can be measured
- Describe the use of echo sounding
- Describe reflection, transmission and absorption of waves
- Construct ray diagrams to illustrate reflection
- Construct ray diagrams to illustrate refraction
- Describe how we hear sound and state the range of frequencies that we can hear
- Describe how sound waves travel through air or solids and explain why sound travels faster in a denser medium
- Explain what ultrasound is and how it is used in medicine
- Describe how ultrasound can be used in industry to investigate or detect hidden or buried objects





Mathematical and Practical Skills

- Investigate the relationship between force and extension for a spring.
- Make observations to identify the suitability of apparatus to measure the frequency, wavelength and speed of waves in a ripple tank and waves in a solid and take appropriate measurements.
- Investigate the reflection of light by different types of surface and the refraction of light by different substances.
- Recall and apply the equation: Pressure = Force ÷ Area
- Recall and apply the following equation:
  Pressure = Height of Column x Density of Liquid x Gravitational Field Strength
- Recall and apply the equation: Force = Spring Constant x Extension
- Recall and apply the following equation:
  Elastic Potential Energy = 0.5 × Spring Constant x (Extension)^2
- Recall and apply the equation: Wave Speed = Frequency x Wavelength
- Translate information between graphical and numerical form
- Understand and use simple mathematical symbols
- Make estimates of the results of simple calculations

Key Terms

Keyword	Definition
Pressure	Force per unit cross-sectional area for a force acting on a surface at right angles to the surface. The unit of pressure is the pascal (Pa) or newton per square metre (N/m^2).
Reflection	The change of direction of a light ray or wave at a boundary when the ray or wave stays in the incident medium.
Refraction	The change of direction of a light ray when it passes across the boundary between two transparent substances (including air).
Boyle's Law	For a fixed mass of gas at constant temperature, its pressure multiplied by it volume is constant.
Hooke's Law	The extension of a spring is directly proportional to the force applied, as long as its limit of proportionality is not exceeded.
Limit of Proportionality	The limit for Hooke's law applied to the extension of a stretched spring.
Longitudinal Waves	Waves in which the vibrations are parallel to the direction of energy transfer.
Transverse Waves	A wave where the vibration is perpendicular to the direction of energy transfer.
Rarefaction	Stretched apart.
Angle of Incidence	Angle between the incident ray and the normal.
Angle of Reflection	Angle between the reflected and the normal.
Normal	Straight line through a surface or boundary perpendicular to the surface or boundary.
Perpendicular	At right angles.
Spring Constant	Force per unit extension of a spring.